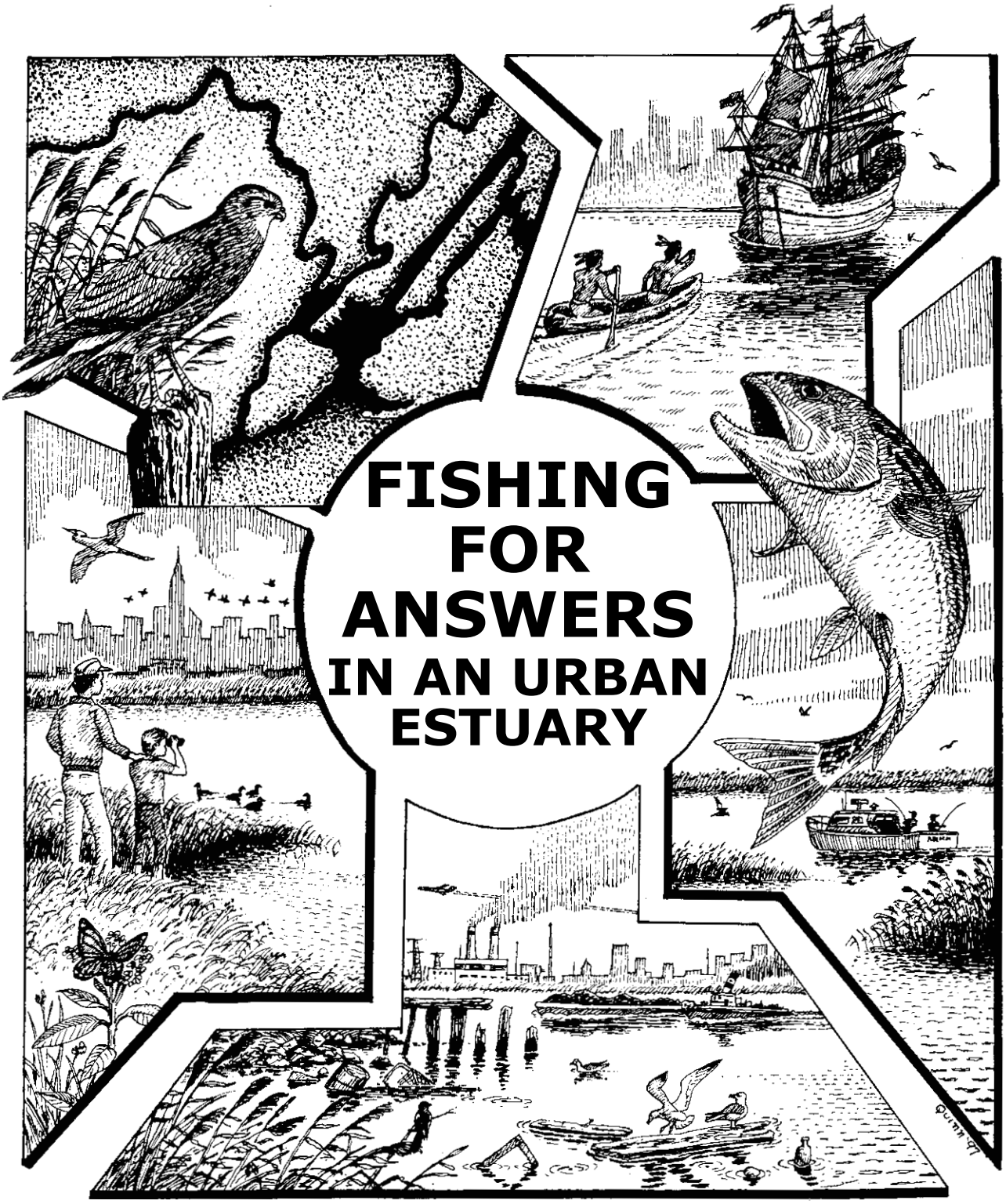

FISHING FOR ANSWERS
IN AN URBAN ESTUARY

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New Jersey Department of Environmental Protection

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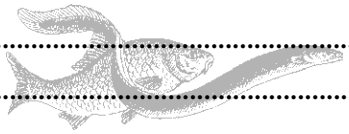

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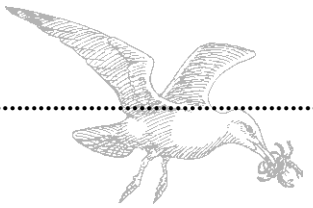

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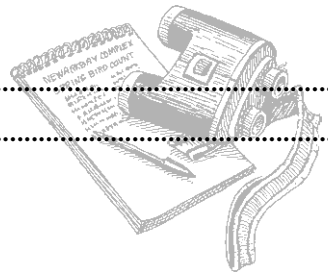

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New Jersey Department of Environmental Protection

New Jersey Department of Environmental Protection's Mission Statement

The NJDEP's mission is to assist the residents of New Jersey in preserving, sustaining, protecting, and enhancing the environment to ensure the integration of high environmental quality, public health, and economic vitality.

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Chief of Staff ..... Gary Sondermeyer
Director, Division of Science,
Research & Technology ..... Eileen Murphy
Director Watershed Management ..... Lawerence J. Baier

Division of Science, Research & Technology

The Division of Science, Research & Technology (DSRT) is the NJDEP's primary scientific, research and technical support unit. The role of the division, through its studies, evaluations, and monitoring efforts, is to provide DEP with a sound technical foundation upon which to base the department's policy and regulatory decisions.

Division of Science, Research and Technology
General Information: (609) 984-6071
Website: www.state.nj.us/dep/dsr

Division of Watershed Management (DWM)

The overarching goals of the Watershed Management Program are: comprehensive water resource management on a watershed basis to ensure "clean and plentiful water" for the residents of New Jersey and their descendants; the protection and restoration of the integrity of New Jersey's water resources by preventing, abating and controlling water pollution to achieve the statewide goal of "fishable and swimable waters". However, there is an intimate relationship between the quality and quantity of surface water. Therefore, DWM must manage both the quantity and quality of the State's water resources, including groundwater, to sustain the water supply needs of the State's residents and ecology.

Division of Watershed Management
General Information: (609) 984-0058
Website: www.state.nj.us/dep/watershedmgt

New Jersey Audubon Society (NJAS)

New Jersey Audubon Society is a privately supported, not-for-profit, statewide membership organization. Founded in 1897, and one of the oldest independent Audubon societies, NJAS has no formal connection with the National Audubon Society.

NJAS fosters environmental awareness and a conservation ethic among New Jersey's citizens, protects New Jersey's birds, mammals, other animals, and plants, especially endangered and threatened species, and promotes preservation of New Jersey's valuable natural habitats. In order to achieve its purpose, NJAS, through its board of directors, professional staff, members, and volunteers endeavors to:

- Develop, encourage and support sound conservation practices, programs, and legislation;
- Disseminate information on the natural environment through education programs, information services, and publications;
- Advance knowledge, through field research, of New Jersey's flora and fauna and their relationship to the habitats on which they depend;
- Acquire, establish and maintain wildlife sanctuaries and education centers.

For membership information and all other inquiries about New Jersey Audubon Society contact:

NJAS Headquarters
9 Hardscrabble Road, P.O. Box 126 • Bernardsville, NJ 07924
(908) 204-8998
e-mail: hq@njaudubon.org • Website: www.njaudubon.org

New Jersey Audubon Society's staffed nature centers are located throughout the state:

Weis Ecology Center
150 Snake Den Road
Ringwood, NJ 07456
(973) 835-2160
weis@njaudubon.org

Lorrimer Sanctuary
790 Ewing Avenue
P.O. Box 125
Franklin Lakes, NJ 07417
(201) 891-2185
lorrimer@njaudubon.org

Scherman-Hoffman Wildlife Sanctuary
11 Hardscrabble Road
P.O. Box 693
Bernardsville, NJ 07924
(908) 766-5787
scherman-hoffman@njaudubon.org

Sandy Hook Bird Observatory
20 Hartshorne Drive
P.O. Box 553
Fort Hancock, NJ 07732
(732) 872-2500
shbo@njaudubon.org

Plainsboro Preserve
80 Scotts Corner Road
Cranbury, NJ 08512
(609) 897-9400
plainsboro@njaudubon.org

Rancocas Nature Center
794 Rancocas Road
Mount Holly, NJ 08060
(609) 261-2495
rancocas@njaudubon.org

Cape May Bird Observatory Center for Research and Education
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Cape May Court House, NJ 08210
(609) 861-0700
cmbo2@njaudubon.org

Nature Center of Cape May
1600 Delaware Avenue
Cape May, NJ 08204
(609) 898-8848
nccm@njaudubon.org

Cape May Bird Observatory Northwood Center
701 East Lake Drive
P.O. Box 3
Cape May Point, NJ 08212
(609) 884-2736
cmbo1@njaudubon.org

INTRODUCTION

The Newark Bay Complex (NBC) is part of the New York/New Jersey Harbor Estuary. It includes tidal portions of the Hackensack and Passaic Rivers, the Arthur Kill, Kill Van Kull and the Newark Bay. The Complex includes five counties and more than 30 local governments with a population of more than three million. The Newark Bay boasts the third largest port in the United States. Some of the communities that touch these waters include Hackensack, Bayonne, Secaucus, Newark, Elizabeth, Lyndhurst, Perth Amboy, Woodbridge, and Jersey City.

History and Growth of the Complex

The Complex has a rich and diverse history dating back to geologic times and more recently to its earliest people - the Lenni Lenape - who lived along the shores and relied on the estuary for food and transportation. During the Industrial Revolution, the Complex became a major route for trade and commerce. At one time, an active oyster industry existed in the Complex, which was responsible for supplying oysters to many communities in the Northeast region. However, this industry collapsed in the 1800's, when the bay was closed to commercial oystering due to water pollution. Over time, much of the shoreline was developed and used for residential, commercial and industrial interests. Today, the Complex continues to provide people with jobs and recreation while still providing the habitats in which animals and plants live.

While much of the growth in the Complex has benefited society as a whole, there have also been negative consequences. Prior to 1970 when the Clean Water Act was put into law, years of municipal sewage discharges and industrial effluents - legal and illegal - caused sediments in the Complex to become contaminated by a variety of toxic and non-toxic chemicals. As a result, there was a loss of wildlife in and around the Complex's rivers, as well as limited recreational use of the water by local residents.

Today's Challenges

In 1977, the federal Environmental Protection Agency (EPA) moved to ban the manufacture of polychlorinated biphenyls (PCBs), a probable carcinogen known to produce toxic effects in the laboratory at very low doses. Due, most likely, to a discharge of well over 500,000 pounds of PCBs from a facility on the Hudson River (Barclay, 1993) these substances along with dioxins and others passed through the aquatic system of the Newark Bay Complex. They continue to build up in the bottom sediments and enter the food chain of crustaceans and finfish. (Shaw, 1994)

In 1982, research conducted by the New Jersey Department of Environmental Protection (NJDEP) in the Newark Bay Complex showed elevated levels of dioxins and PCBs in certain fish and crabs (Belton et. al., 1982). Subsequently, advisories were adopted by the state to guide citizens regarding safe consumption practices. The species under advisory include bluefish, blue crabs, American Eels, white perch, striped bass and white catfish. (Appendix A)

In addition, development pressures continue to be an issue as the region struggles to maintain the balance between growth and the need for open space and public access to the rivers.

Why a Teaching Guide?

There are many people who fish the waters of the Newark Bay Complex for recreation and to provide food for their families. Fishing organizations and environmental groups were concerned that urban recreational anglers were not receiving vital health information about consumption of contaminated fish and crabs. These groups approached the NJDEP and asked that a special outreach effort be initiated in the Complex. As a result, a program was initiated in the fall of 1993 to design education and information initiatives and tools that would explain the fish consumption advisories and health effects from consumption of contaminated fish and crabs to the people of the Newark Bay Complex. This publication is one outcome of that ongoing effort.

Kerry Kirk Pflugh
Project Director
2004

REFERENCES

Barclay, B. *Hudson River Anger Survey.* Poughkeepsie, New York: Hudson River Sloop Clearwater, Inc. 1993

Belton, T.J., Ruppel, B.E., and Lockwood, K., 1982, *PCBs (Anocher 1254) in Fish Tissues Throughout the State of New Jersey: A Comprehensive Survey.* Trenton: New Jersey Department of Environmental Protection, Office of Cancer and Toxic Substances Research, 36p.

Shaw, J.A. *Risk Management Teams: State and Local Cooperation to Protect Public Health in Urban Coastal Communities.* Atlanta, Georgia: ATSDR Conference, 1994.

ABOUT THIS GUIDE

OVERVIEW

Urban estuaries offer a valuable opportunity for millions of people to explore the unique features of a sensitive and diverse environment. *Fishing for Answers in an Urban Estuary* provides teachers and their students in grades 4 to 8 the framework for such an opportunity. Although this guide was prepared for the Newark Bay region, there are urban estuaries worldwide and the lessons can be adapted easily to other sites.

All of the activities in the guide have been field tested by teachers for

1) grade level appropriateness
2) effectiveness of the hands-on activities in communicating learning outcomes and building critical thinking skills
3) degree of interdisciplinary application
4) ease of using in an established curriculum, and
5) degree to which the lessons address diverse learning styles.

LEARNING OUTCOMES

There is great variance in the public's understanding of estuary dynamics and how residential and commercial activities impact its health. To help teachers and students understand this dynamic more richly, it is feasible to explore concepts and develop skills in the sciences, social studies, the arts, and math with an environment-based focus. Exposure to issues surrounding the estuary will direct learners to apply their knowledge and creativity toward managing and caring for the environment in addition to minimizing impacts on human health.

Fishing for Answers in an Urban Estuary is designed to teach school-age children in grades 4 to 8 about the unique natural and historical features of the Newark Bay Complex, the importance of the estuary from economic and ecological perspectives and their role in maintaining the balance between human need and environmental protection.

Upon completion of the lesson plans, students will be able to:

- Understand the functions and value of the estuary as they relate to animals, plants and people;
- Identify the geographic areas where fish consumption is a concern;
- Cite reasons why consumption should be limited or avoided;
- Identify the six fish species in this region under state advisory;
- Identify ways to prepare fish to reduce or avoid exposure to contaminants;
- Infer ways to reduce contaminants over time and propose sound measures to help improve the ecosystem;
- Understand the links between pollution, habitat contamination, contaminated fish and human health;

- Understand how human actions can have positive and negative impacts on natural systems;
- Understand the need to protect and use resources wisely;
- Understand the need to engage in pollution prevention and non-point source pollution prevention behavior; and
- Understand the benefits of being involved in related community activities.

CORE CURRICULUM CONTENT STANDARDS

In 1996 the New Jersey Department of Education adopted the Core Curriculum Content Standards to guarantee that all students receive a "thorough and efficient" education. Each content area has standards that outline the major concepts that students should know at various stages of their education. Progress indicators for each standard further focuses on what the students should know at various levels. Since these standards change periodically, a complete list of correlations for *Fishing for Answers* lessons can be downloaded from www.njaudubon.org/education.

Copies of the Core Curriculum Content Standards can be ordered from the New Jersey State Department of Education, Office of Publications, 2225 W. State Street, P.O. Box 500, Trenton, NJ 08625-500 or online at www.state.nj.us/njded/cccs/index.html

SECTION & LESSON OVERVIEW

This guide is divided into six sections:

Section 1 - The Newark Bay Complex, *A Natural System*
Section 2 - The Newark Bay Complex, *Rich in History*
Section 3 - The Newark Bay Complex, *Teeming with Life*
Section 4 - Newark Bay's Complexities
Section 5 - Community Outreach
Section 6 - Appendices

Sections 1-3 provide fully developed lessons with the following format:

- Grade level, time needed, keywords and materials
- Goal of the lesson, specific student objectives and the process skills that students will use
- An "Advisory Link" that describes how the lesson content supports the goals of the Fish Consumption Advisories
- Background information for the teacher
- Prerequisites for the students
- Preparation for the teacher
- Procedure needed for the activity:
  - *Setting the Stage*: focuses the students' attention on the activity;
  - *The Action*: a series of hands-on lessons, experiments, simulations and/or demonstrations that involve the students in learning the concepts, and
  - *Assessment*: either embedded in the lesson with direct questioning and discussion or used after the lesson to see if the students can take the information that they learned and apply it to a new situation.

- Extensions that help carry the lesson into more longer-term or broader applications
- Staying Involved can encourage students to take the knowledge they have learned into the community through suggested concrete strategies
- Related Education Resources lists other supplemental guides that have similar lessons
- Reference materials that were used for factual portions of the activity

In addition, some activities include figures and diagrams that can be used to share information and "Discovery Sheets" that help students organize data, read maps, and complete their independent research.

Section 4 provides a method for students to learn about some of the major issues in the Newark Bay Complex. Using one or several of the instructional strategies provided, the teacher can facilitate his/her students' understanding of the NBC's complexities. It also provides information on how to receive a full color poster and accompanying information on over 60 species of animals and plants that are found within the Complex.

Section 5 provides information on how to "catch and release" a fish properly as well as how to get involved in monitoring your local waterway.

Section 6 is the Appendices and includes text for the Fish Consumption Advisories, samples of the Community Awareness signs in a variety of languages, suggestions for field trips in the Newark Bay Complex, public access areas for fishing, organizations to contact for more information about the Complex, a glossary, and a bibliography for the education resources mentioned in the activities.

The Newark Bay Complex